

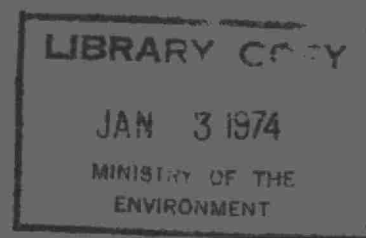
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# OPERATING SUMMARY

TD227  
K57  
W38  
1972  
MOE

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# KITCHENER



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Ministry of the  
Environment

135 St. Clair Avenue West  
Toronto 195, Ontario

We are pleased to present you with the 1972 operating summary for the water pollution control plant serving your community.

This summary contains data on the performance of the plant as well as relevant financial information. Of particular interest is the review of the year's activities in which significant items of these data are discussed in some detail by the operations engineer and his staff who, by their day-to-day involvement with the operation, are thoroughly familiar with the plant.

We appreciate your continuing interest in protecting the environment through the efficient operation of this wastewater treatment facility.

D.S. Caverly,  
Assistant Deputy Minister.

D.A. McTavish, P. Eng.,  
Director,  
Project Operations Branch.

TD  
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J. Nurmberg

135 St. Clair Avenue West  
Toronto 195

KITCHENER  
WATER POLLUTION CONTROL PLANT

operated for  
THE CITY OF KITCHENER  
by the  
MINISTRY OF THE ENVIRONMENT

1972 ANNUAL OPERATING SUMMARY

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# DESIGN DATA

PROJECT NO. 2-0019-58

TREATMENT Activated Sludge

DESIGN FLOW 11.0 mgd (Prim)  
13.5 mgd (Sec)

DESIGN POPULATION 100,000

BOD - Raw Sewage 300 mg/l  
- Removal 95%

SS - Raw Sewage 450 mg/l  
- Removal 95%

## PRIMARY TREATMENT

### Screening

- Manually cleaned bar screen with 4" spacing

### Comminution

- One Worthington comminutor

### Grit Removal

Type: Aerated; grit removed by air lift  
Size: Two 11' x 10' x 10.5' deep  
(13,700 gal)  
Retention: 1.7 min

### Air Supply

- Two Sutorbilt blowers

## Primary Sedimentation

Type: Dorr  
Size: Four 60' x 60' x 11' 8" swd  
(1.01 mil gal)  
Retention: 2.2 hours  
Loading: Surface, 765 gal/ft<sup>2</sup>/day  
Weir, 26,200 gal/ft/day

## SECONDARY TREATMENT

### Aeration Tanks

Type: Mechanical aeration,  
serpentine flow (14 cells/tank)  
Size: Four 210' x 60' x 13' 3"  
(680,000 cu ft or 4.2 mil gal)  
Retention: 7.5 hours

### Aerators

Type: Ames Crosta (56)

### Secondary Sedimentation

Type: Dorr  
Size: Four 80' dia x 10' swd  
(1.35 mil gal)  
Retention: 2.4 hours  
Loading: Surface, 672 gal/ft<sup>2</sup>/day  
Weir, 13,400 gal/ft/day

## CHLORINATION

Type: BIF with evaporator  
Size: One 2000 lb/day  
One 600 lb/day

### Chlorine Contact Chamber

Size: (141,000 gal)  
Retention: 15 min

## OUTFALL

- to Grand River

## SLUDGE HANDLING

### Digestion System - Two-stage

Primary --

Type: Dorr, single mixer  
Size: Two 65' dia x 22' swd  
(144,000 cu ft or 0.90 mil gal)  
Loading: 1.08 lb/cu ft/day

Secondary --

Type: Dorr, floating cover  
Size: Two 100' dia x 29' swd  
(400,000 cu ft or 2.5 mil gal)  
Total Loading: 0.29 lb/cu ft/mo

### Vacuum Filter

Type: Komline - Sanderson  
Size: One 500 sq ft



## GENERAL

In 1972, the Kitchener Water Pollution Control Plant treated a total of 4,616.3 million gallons at an operating cost of \$343,246.89, representing a unit cost of \$74.30 per million gallons of sewage treated, 3.8 cents per pound of BOD removed or 2.6 cents per pound of suspended solids removed.

Under the supervision of head office engineers, the plant staff continued to operate a clean, attractive and efficient plant for the City of Kitchener.

## PLANT FLOWS & CHLORINATION

In 1972 the average daily flow was estimated to be 12.6 million gallons. This represents an increase of 7.7 percent as compared to the average daily flow in 1971 of 11.7 million gallons. The aeration section design flow of 13.5 MGD and the primary section design flow of 11.5 MGD were exceeded 30 percent and 50 percent of the time respectively.

An average chlorine dosage rate of 3.1 mg/l was required to maintain an average chlorine residual of 0.5 mg/l in the final effluent.

## PLANT EFFICIENCY

The average raw sewage BOD of 222 mg/l was approximately 30 percent less than the design value of 300 mg/l but the design value was exceeded 10 percent of the time. The Ministry of the Environment effluent objective of 15 mg/l BOD was exceeded 60 percent of the time. The average BOD removal efficiency was 91 percent resulting in an average effluent BOD of 21 mg/l.

The average raw sewage suspended solids concentration of 297 mg/l was approximately 66 percent of the design value of 450 mg/l, with the design value being exceeded only 3 percent of the time. The suspended solids removal efficiency of 95 percent was excellent resulting in an average effluent suspended solids of 16 mg/l. The Ministry of the Environment effluent suspended solids objective of 15 mg/l was exceeded 60 percent of the time.

-The average primary effluent BOD and suspended solids concentrations were 167 mg/l and 147 mg/l respectively. The primary clarifier average BOD and suspended solids reduction efficiencies were 25 percent and 50 percent respectively.

The average MLSS concentration of 2,312 mg/l and F/M ratio of 0.23 are within the accepted limits of good aeration tank operations.

The organic loading in terms of concentration was similar to 1971 and was within the acceptable limits. The stabilization of the organic loading can be attributed to the City of Kitchener's industrial waste program.

#### SLUDGE DIGESTION & DISPOSAL

A total of 23.47 million gallons of sludge was pumped to the primary digesters. The raw sludge averaged 5.2 percent total solids of which 70 percent was volatile matter.

Digested sludge from the secondary digester averaged 3.2 percent total solids of which 58 percent was volatile matter. Digested sludge was disposed by tank truck haulage to farm land and by pumping to a sludge lagoon.

#### CONCLUSIONS & RECOMMENDATIONS

Average BOD and suspended solids reductions of 91 and 95 percent respectively indicated that the plant was operated very well for the City of Kitchener.

A design report to expand the plant is being reviewed. It is recommended that expansion procedures move as quickly as possible.

## PROJECT COSTS

KITCHENER #2-0019-58 - Stage 1.

### NET CAPITAL COST

1, 312, 746.07

---

Long Term Debt to MOE

1, 312, 746.07

---

Debt Retirement Balance at Credit  
(Sinking Fund) December 31, 1972

828, 488.64

---

Net Operating  
Debt Retirement  
Reserve  
Interest Charged

343, 050.06

13, 951.00

73, 617.44

---

TOTAL

430, 618.50

---

### RESERVE ACCOUNT

Balance @ January 1, 1972

142, 260.76

Deposited by Municipality

Interest Earned

9, 034.69

Less Expenditures

18, 000.00

---

Balance @ December 31, 1972

133, 295.45

---

## PROJECT COSTS

KITCHENER #2-0019-58 - Stage 2.

### NET CAPITAL COST

1, 488, 607. 70

DEDUCT - Portion financed by  
CMHC (final)

(1, 016, 967. 77)

Long Term Debt to MOE

471, 639. 93

Debt Retirement Balance at Credit  
(Sinking Fund) December 31, 1972

208, 387. 47

Debt Retirement  
Reserve  
Interest Charged

9, 013. 00

6, 790. 50

26, 449. 07

TOTAL

42, 252. 57

### RESERVE ACCOUNT

Balance @ January 1, 1972

76, 486. 77

Deposited by Municipality

6, 790. 50

Interest Earned

5, 076. 03

Balance @ December 31, 1972

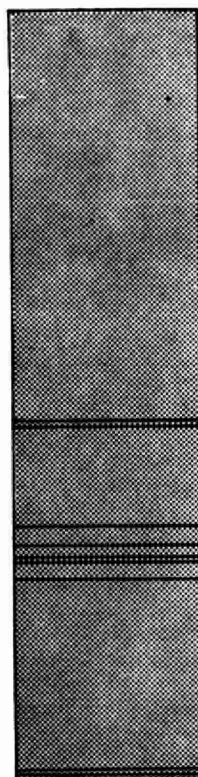
88, 353. 30

## MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	REGULAR PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY*	WATER	TRAVEL
JAN	16,646.11	12,632.43	18.55		3622.43		118.88		134.35	119.47		
FEB	23,014.54	13,220.62		141.88	3480.97		142.84	154.55	1742.75	4087.88		43.05
MAR	23,480.39	12,955.42			3834.21	34.50	643.60	96.01	863.59	4910.65	139.41	3.00
APR	23,365.28	14,159.22			3532.94	2464.00	194.71	27.16	359.17	2609.88		18.20
MAY	20,815.95	13,302.19			3259.78		1125.48	50.00	423.85	2522.65		132.00
JUNE	41,358.61	19,225.11	660.60		3099.40	2735.00	8252.65	148.48	807.13	6378.36	51.88	
JULY	10,885.76	332.03			3389.23	173.73	147.18		1397.23	5409.46		36.90
AUG	25,658.25	12,801.42	1786.61		3418.47		128.89	23.75	157.07	7342.04		
SEPT	29,144.03	13,930.53	1730.90		3269.21	1369.20	7241.22	102.52	1609.24	14287.25	86.40	
OCT	18,943.79	14,437.36	237.48		3228.69	52.50	217.22	1.50	329.59	402.15		37.30
NOV	37,507.93	691.57			3317.38			122.59	1573.31	31803.08		
DEC	72,426.25	48,305.58	1317.30		8072.44	2772.90	2,357.15	12.96	2873.19	6,516.41	51.82	146.50
TOTAL	343,246.89	175,993.48	5751.44	141.88	45525.15	9601.83	6,087.38	739.52	12270.47	86,389.28	329.51	416.95

Brackets indicate credit.

\* Sundry includes sludge haulage costs of \$60,001.30



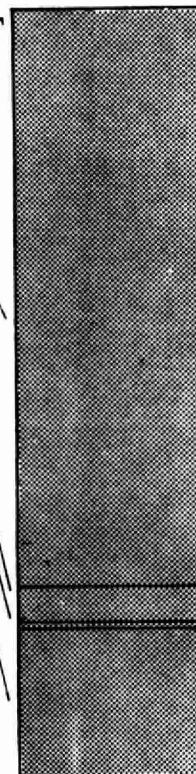
## OPERATING COSTS

● PAYROLL	53 %
● FUEL	<1 %
● POWER	13 %
● CHEMICALS	3 %
● GENERAL SUPPLIES	2 %
● EQUIPMENT	<1 %
● REPAIRS & MAINTENANCE	3 %
● SUNDRY	25 %
● WATER	<1 %
● TRAVEL	<1 %

# 1972 COSTS

## TOTAL ANNUAL COST

NET OPERATING	75 %
DEBT RETIREMENT	5 %
RESERVE	1 %
INTEREST	21 %

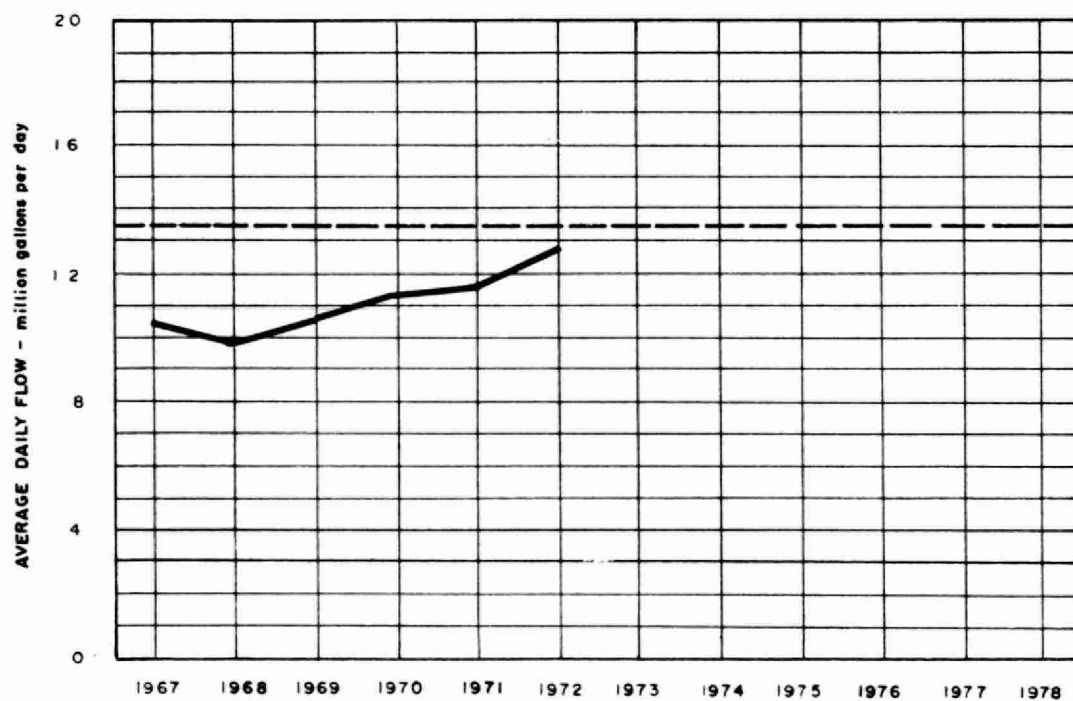
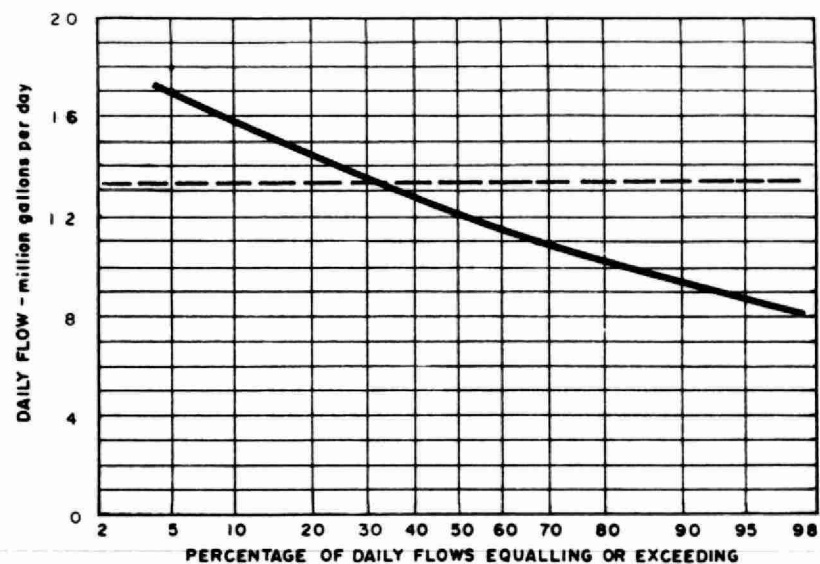


## YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	TREATMENT COSTS	
			\$ per million gal	£ per lb BOD
1968	3648	\$291, 978.36	80	2.8
1969	3888	\$275, 557.76	71	3.0
1970	4130(est)	\$275, 977.71	67	2.9
1971	4284	\$299,109.54	70	3.0
1972	4616	\$343, 246.89	74	3.8

## PROCESS DATA

# FLOWS

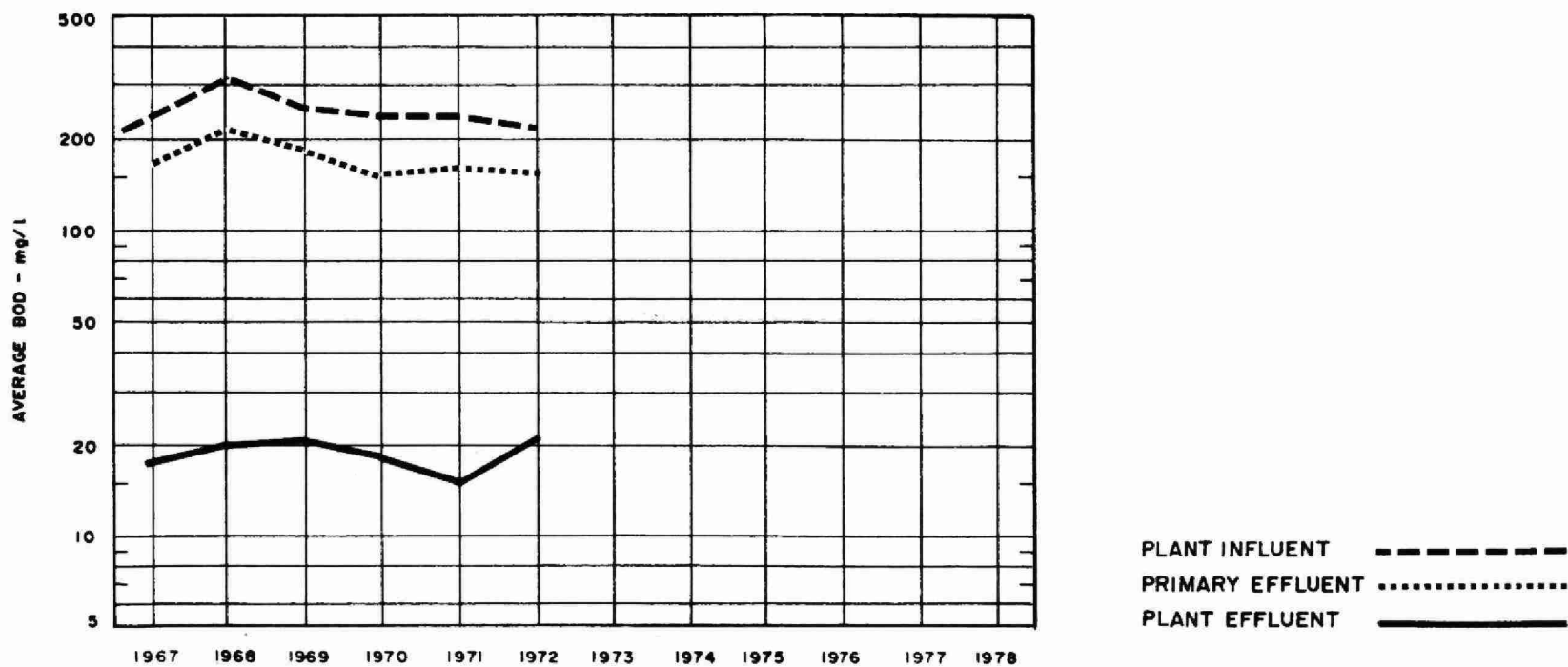
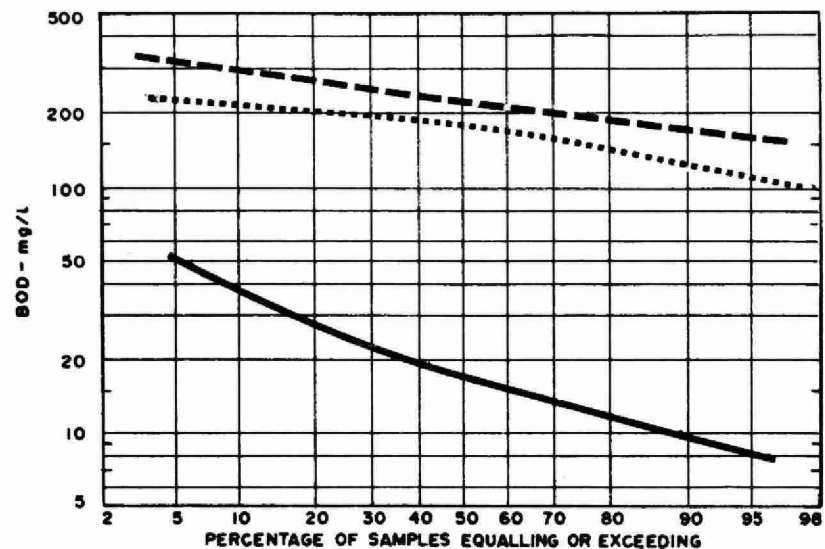


## PLANT PERFORMANCE

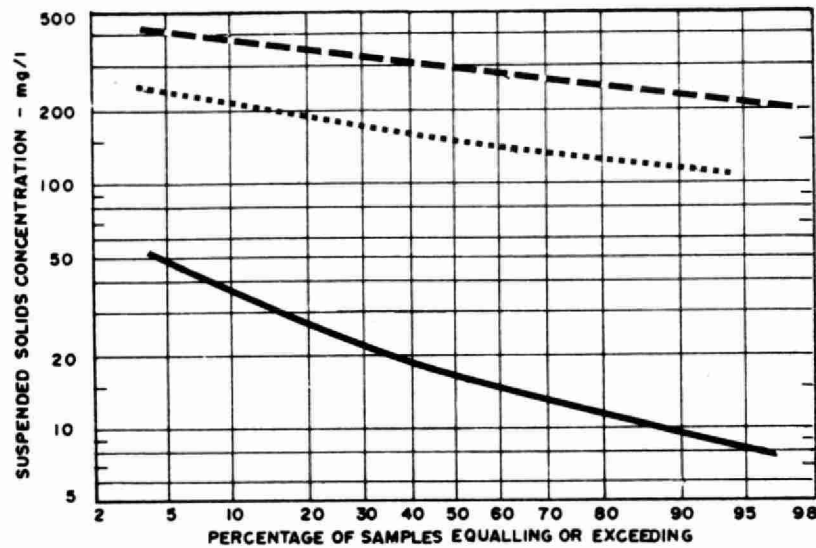
MONTH	FLOWS			BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				PHOSPHORUS	
	TOTAL FLOW million gallons	AVERAGE DAY mil. gal	MAXIMUM DAY mgd	INFLUENT mg/l	EFFLUENT mg/l	REDUCTION		INFLUENT mg/l	EFFLUENT mg/l	REDUCTION		INFLUENT mg/l P	EFFLUENT mg/l P
						%	10 <sup>3</sup> pounds			%	10 <sup>3</sup> pounds		
JAN	373.2	12.0	14.5	200	50	75	560	309	19	94	1080	5.2	5.0
FEB	327.5	11.3	12.4	160	12	93	480	323	12	96	1020	10.0	5.5
MAR	425.7	13.7	21.3	249	38	85	900	307	20	93	1220		
APR	429.4	14.3	21.0	211	12	94	850	255	11	96	1050	11.0	4.6
MAY	397.9	12.8	16.1	224	15	93	830	307	11	96	1180	10.0	6.3
JUNE	284.7	12.8	15.0	212	20	91	740	290	10	97	1080	10.0	6.1
JULY	362.3	11.7	14.6	198	19	90	650	235	8	97	820		7.4
AUG	362.8	11.7	13.6	237	30	87	750	301	16	95	1030		
SEPT	355.6	11.9	14.9	244	26	89	770	322	23	93	1060	11.0	9.0
OCT	391.1	12.6	19.6	218	11	95	810	304	13	96	1138	11.0	6.2
NOV	395.0	13.2	16.6	226	17	92	830	311	13	96	1180	9.0	6.0
DEC	411.1	13.3	19.7	227	42	81	760	314	34	89	1150	9.8	6.4
TOTAL	4616.3	-	-	-	-	-	8930	-	-	-	13008	-	-
AVG.		12.6	MAXIMUM 21.3	222	21	91	744	297	16	95	1084	9.7	6.2
No. of Samples	-	-	-	69	70	-	-	216	216	-	-	9	10



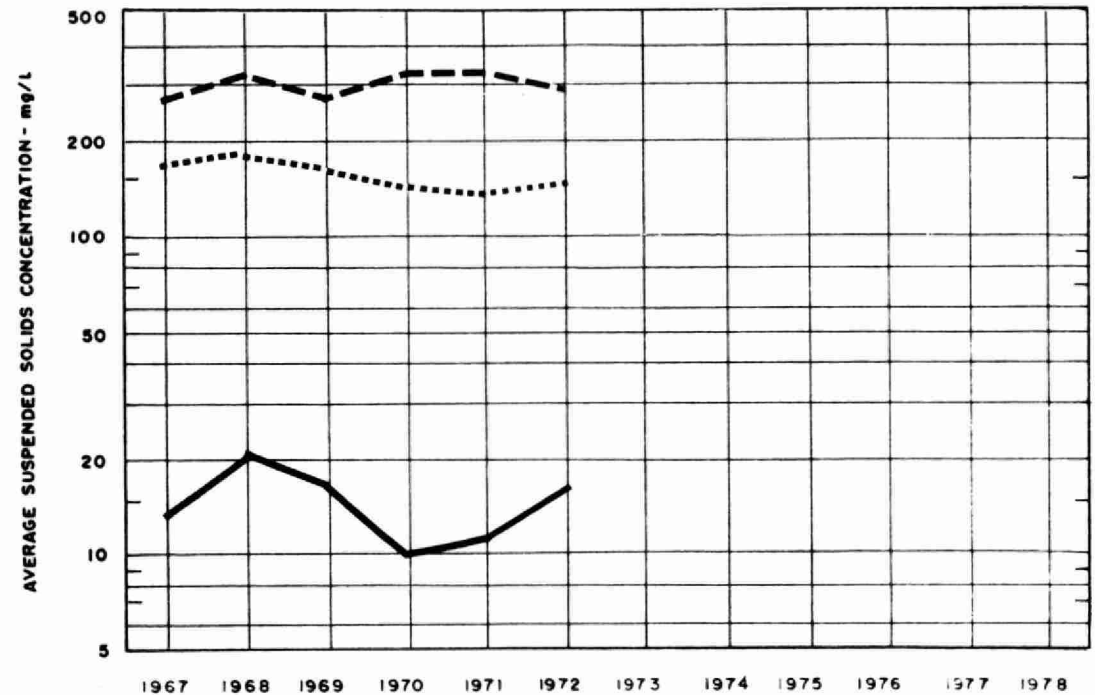
# BIOCHEMICAL OXYGEN DEMAND



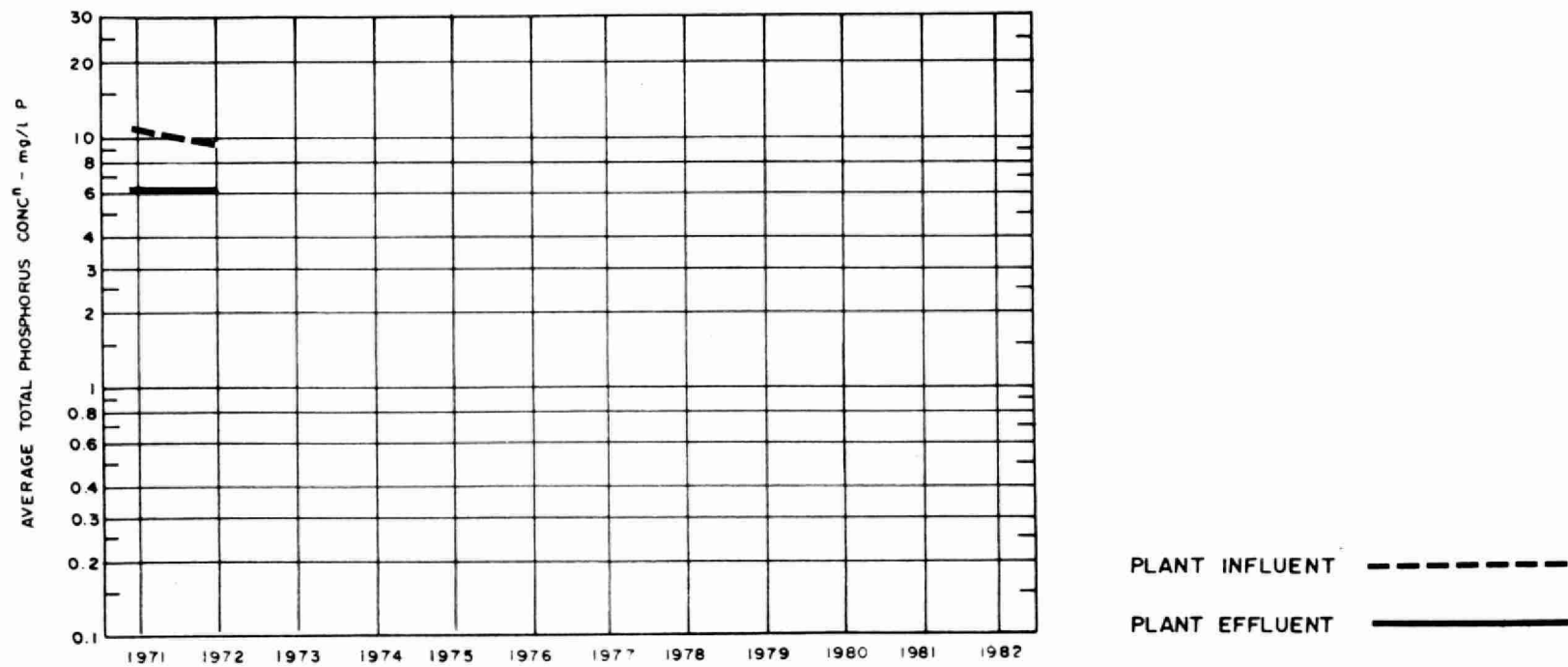
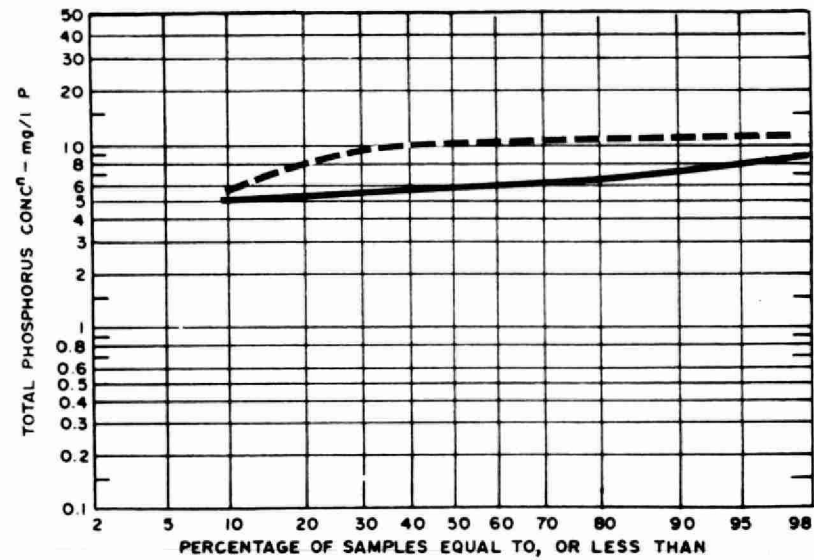
# SUSPENDED SOLIDS



PLANT INFLUENT        
 PRIMARY EFFLUENT      
 PLANT EFFLUENT     

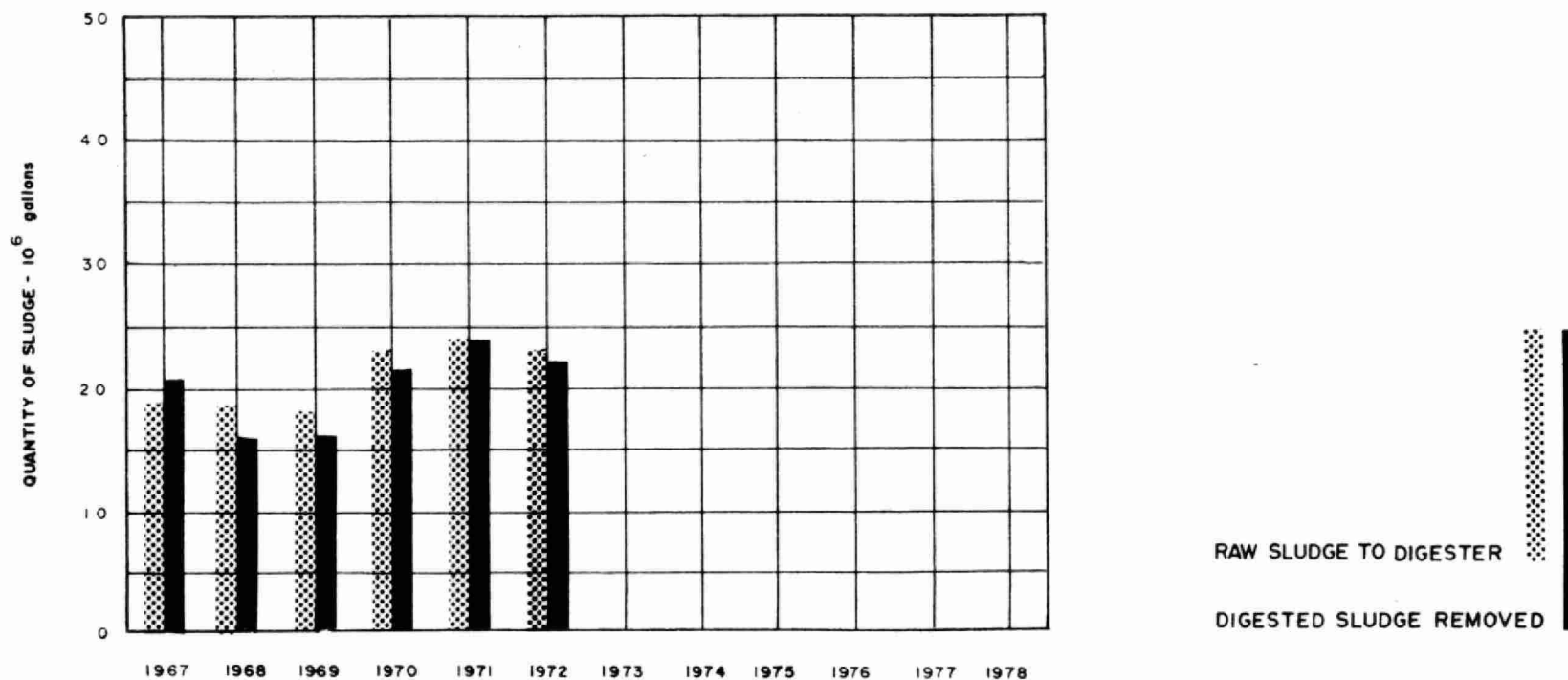
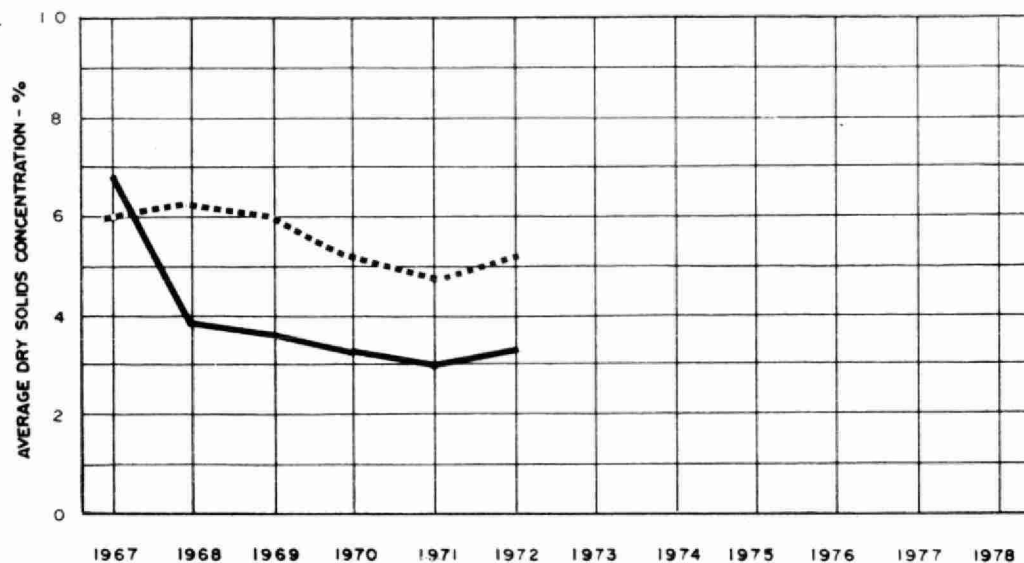


# PHOSPHORUS



# DIGESTION

RAW SLUDGE .....  
DIGESTED SLUDGE ———



## TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
	QUANTITY REMOVED cubic feet	CL <sub>2</sub> USED 10 <sup>3</sup> pounds	AVG. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day <sup>-1</sup>	AIR 1000 ft <sup>3</sup> lb BOD	RAW SLUDGE			DIGESTED SLUDGE			SUPER- NATANT T. S. %	AMOUNT HAULED cubic yards
									QUANTITY 10 <sup>3</sup> gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 10 <sup>3</sup> gallons	TOTAL SOLIDS %	VOL. SOLIDS %		
JAN	217	8.9*	3.0	160	175	2470	.20		2130	5.2	78	2120	2.7	58		4992
FEB	252	10.4	3.2	150	157	2420	.19		2190	5.3		2080	3.2			5668
MAR	399	8.5*	3.6	195	165	2360	.29		2110	5.4	72	1940	2.8	58		3140
APR	350	9.7	2.3	165	138	2410	.25		1850	5.7	69	1690	4.0	58		3010
MAY	308	14.2	3.6	171	137	2250	.26		1920	5.2	72	1980	3.1	57		7764
JUNE	287	11.9	3.1	176	145	2320	.25		1780	5.3	70	1780	3.0	59		6380
JULY	399	12.6	3.5	142	123	2200	.19		1840	4.9	66	1840	3.2	57		7120
AUG	294	10.0*	2.9	138	136	2120	.19		1930	5.0	70	2090	3.3	56		10140
SEPT	210	13.0*	3.9	168	142	2060	.24		1740	5.1	69	1600	3.3	55		7390
OCT	280	11.4	2.9	165	151	2340	.22		1958	5.2	70	1890	3.2	58		7510
NOV	273	10.1*	2.6	172	163	2320	.25		2030	4.9	69	1550	3.4	58		7820
DEC	518	11.1*	2.7	178	149	2470	.24		1990	4.7	68	1580	3.5	57		4230
TOTAL	3787	131.8	-	-	-	-	-	-	23468	-	-	22140	-	-	-	75164
AVG.	.8 cu. ft/mil gal	11.0	3.1	167	147	2312	.23		1956	5.2	70	1845	3.2	58		6264

\* Number of days during month on which chlorination practiced.

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